MINING PROPERTY AT RICO, COLORADO

RICO ARGENTINE MINING COMPANY

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General Features

The principal mining property of the Rico Argentine Mining Company is in Dolores County in the southwestern corner of Colorado at and around the town of Rico. The district is officially known as the Pioneer Mining District and the more extensively mineralized and productive part is about eight square miles in extent. By far the most productive part is owned by the company which holds 1,962 acres of patented and approximately 1,100 acres of unpatented claims.

Rico is a typical old mining town with a population of about 350. Probably one-half of these are Navajo Indians. The company's mining operation which for many years has been economic mainstay of the town now employs about 55 people most of whom are Indians.

Colorado Highway 145, now a paved road, has made Rico very accessible. Since its completion summer tourists are becoming more numerous. The largest nearby town is Cortez, population 7,000, 50 miles distant. Dove Creek, the county seat of Dolores County, population 1,000, is 70 miles away.

Rico is a scenic area on the Dolores River at an elevation of 8,800 feet. The surrounding mountains rise steeply to over 12,000 feet and are mostly covered with aspen, fir, and spruce. Snowfall is fairly heavy in the winter, and summers are very pleasant.

There are good gravel roads within the district to the principal productive mines. The company's present operation at the Argentine mine, where there is a 150-ton-a-day flotation mill, is about two miles northeast of Rico. The now-dormant but highly-productive Mountain Springs area is one and one-half miles north of the town, and the acid plant about one mile. Newman Hill, an old rich silver area, is one-half to one mile southeast of the town.

History

The history of the Rico Argentine Mining Company is in part the history of the district, as the present company owns all of the past major producers and for the last 30 years has been the principal and for most of the time the only one.

The Rico or Pioneer Mining District was first discovered in 1869; however, little prospecting was done until 1878. In 1879 rich silver ore was discovered on Nigger Baby Hill, and the present town of Rico was started. During the 1880's several small and short-lived smelters were erected. In 1887 rich silver ore was discovered on Newman Hill and from then until 1896 was the peak silver-gold production period. Scattered and sporadic operations continued until the mid-1920's with peak copper production during World War I. In the mid-1920's two strong and experienced companies, St. Louis Smelting and International Smelting, entered the district and actively explored. The St. Louis company concentrated principally on the Mountain Springs, Silver Swan, and Argentine areas, and International on the fringes of Newman Hill and, later, on drilling to the Devonian limestone. International in 1926 erected the first flotation mill in the district, and production of lead and zinc was substantial until terminated in 1930 by the drop in metal prices. During the early 1930's prospecting and mining were at a standstill.

The inception of the present company was in 1936 when the J. A. Hogle interests of Salt Lake City acquired control of the old Rico Argentine Mining Company which had been formed in 1911. It had operated in a small way until the 1920's when it reached a dividend-paying basis but was forced to shutdown by the depression. Its principal holdings and operations had been in the Argentine area.

Upon the Hogle interests' acquiring control considerable exploration was done, at first, principally in the Argentine area. In 1939 a 100-ton-a-day flotation mill was constructed and the production of lead and zinc concentrates was begun which has continued up to the present. During the 1940' s other properties were acquired including the large holdings of the St. Louis and International Smelting companies.

In 1955 a 160-ton-a-day acid plant was completed, and it operated until 1965. Sulphuric acid was sold to the nearby uranium mills. The pyrite from which the acid was produced was obtained at first from the flotation mill tailings and later was mined underground principally in the Mountain Springs area. During this period the production of lead and zinc concentrates was down as lead and zinc prices were low and the facilities of the company were needed for the mining of pyrite.

During the 1950's and the 1960's the company made a number of investments some of which were in Consolidated Eureka Mining Company, Banner Mining Company, H-K Company for the exploitation of the brines of Great Salt Lake, and Dairy King Corporation. These investments took much of the capital which ordinarily would have gone into the exploration of the company's extensive property holdings at Rico. Dividends totalling $1,343,680 were paid by the company from 1940 through 1965.

Production

Production of the district and the present Rico Argentine Mining Company has been derived from several sources. In the table below that for the period 1879 through 1923 is from U. S. Geological Survey Professional Paper 138; that for 1924 through 1938 is from the annual Mineral Resources volumes; and that for 1939 through June, 1970 from the records of the company. As far as known the production of the metals is given in terms of content of concentrates or direct smelting ore so that it comes close to being recovered metal.

		Ounces		Pounds		
	Tons	Gold	Silver	Copper	Lead	Zinc
1879-1903	no data	83,174	10,145,173	828,062	24,618,647	1,248,680
1904-1923	124,140	12,549	1,533,754	5,415,819	12,503,497	9,537,636
1924-1938	222,216	5,027	1,229,168	1,899,458	36,426,450	36,281,800
1939-1970	846,423	2,593	2,857,444	3,800,169	99,127,402	135,263,224
Total		103,343	15,765,539	11,943,508	172,675,996	182,331,340

The total is probably low for copper and zinc as frequently payment was not made for those metals particularly prior to 1903. The figures for 1939-1969 are for the company production only and therefore are slightly low for the district as there was a little other scattered production.

Average calculated grade of ore for the above production is:

		Ounces		Percent		
	Tons	Gold	Silver	Copper	Lead	Zinc
1879-1903	Insufficient data					
1904-1923	124,140	.101	12.35	2.10	5.04	3.84
1924-1938	222,216	.023	5.53	.43	8.20	8.20
1939-1969	846,423	.003	3.37	.22	5.85	7.99

Value of the above production at present metal prices of $35.00 gold, $1.70 silver, $.60 copper, and $.15-1/2 lead and zinc is over $92,600,000. It is very probable that properties now held by the company produced over 95% of this total.

In addition to the afore-mentioned metal production, the company in the years 1956 to 1965 produced 316,119 tons of 100% sulphuric acid having an average value of $20 per ton at Rico for a total of $6,322,380.

This acid production required 383,000 tons of pyrite of which 75,000 came from the highly-pyritic Argentine mill tailings and the remainder from underground mining principally in the Mountain Springs area. From time to time small shipments of pyrite for various uses have been made which in the aggregate probably total about 11,000 tons. A small amount of calcine, the waste product from the burning of pyrite for acid, is sold annually. Since considerable of the zinc and copper production was not included in the tabulation on the foregoing page, particularly in the early years, it is reasonable to assume that total metal production and other products has a valuation at present prices of over $100,000,000.

Geology

A major feature is an elongate east-west domical uplift that has been dissected by the south-flowing Dolores River. This uplift and the subsequent erosion have exposed formations ranging in age from Pre-Cambrian, through the Paleozoic, to the Cretaceous. These sedimentary and altered sedimentary formations of phyllite, quartzite, sandstone, shale, and limestone with a few altered igneous rocks have been intruded throughout the area by various types of porphyry sills and dikes and on the west by a monzonite stock. East-west faults with major displacements up to and over 1,000 feet cut the dome. Northeast and northwest striking faults of minor displacements are present and of economic importance. Most of the faults have normal displacement but there are a few exceptions. Surficial deposits of alluvium, talus, and landslide obscure much of the bedrock.

The mineralization is dominatly lead, zinc, copper, gold, and silver occurring as the sulphide minerals galena, sphalerite, and chalcopyrite, usually accompanied by abundant pyrite and occasionally by small amounts of hematite and magnetite. In a few areas there are high silver-bearing minerals such as argentite, proustite, polybasite, and tetra hedrite. Oxidation only goes to shallow depths so that in general there is little secondary enrichment although sufficient to account for some of the first high-silver discoveries in the district.

The mineralization occurs as veins and replacements in the interbedded sandstone, shale, and limestone of the Middle and Lower Hermosa formations of Pennsylvanian age and in the Ouray limestone of Devonian age. The replacement type of mineralization favors the limestone beds.

Some mineral zoning is present. Copper is more common in the western part of the area near the monzonite stock which may be the center of mineralization. In this area the altered Devonian limestone has such minerals as specularite, magnetite, chlorite, epidote, garnet, and wollastonite which are suggestive of higher temperatures. Copper is also

more common at the south end of the Argentine workings where prophyry intrusives are more numerous. The Newman Hill area had high silver and gold values along with lead and zinc while the Argentine and Mountain Springs areas have relatively low silver and gold with the lead and zinc.

Principal Productive Areas

Argentine

At the present time the only productive area is the Argentine. About 150 tons a day are now being mined and milled with an average grade of 5 to 7% lead, 7 to 10% zinc, and 2 to 3 ounces silver per ton of ore. Lead and zinc concentrates are shipped to Bunker Hill Co. at Kellogg, Idaho. Production from the area prior to 1937 is not known but was substantial. Since 1937 the company has mined and treated over 425,000 tons from this area.

Mining is now being done from a 700-foot shaft and the ore is delivered to a mill near its collar. All of the ore is coming from between the 600 and 700 levels which are the bottom ones. Ore available for mining will be exhausted this fall. Approximately 30,000 to 40,000 tons of ore have been developed at this location for each 100 feet in depth, and it is reasonably certain that such an amount would be made available for mining by an 800 level. However, with continued depth the ore beds will be displaced to a still lower elevation by a fault.

The Argentine ore occurs principally in pipe-like bodies at the intersection of the northwest-trending Blackhawk Fault with at least nine north-dipping limestone beds in the Middle Hermosa formation. These limestones vary in thickness from 5 to 45 feet and occur throughout the entire Middle Hermosa formation which at the Argentine is about 550 feet thick. The limestone beds are replaced by pyritic lead-zinc mineralization for distances of a few to a hundred feet out from the fault. Mineralization has been mined through a vertical distance of over 2,000 feet without any apparent change in its nature and could be expected to continue in depth except for displacement by faults. In the southern part of the area ore has been found at the margins of porphyry intrusives and there has been some increase in copper in this direction.

Mountain Springs

Production from this now-dormant area prior to 1937 is not known but was very substantial as indicated by maps of the old stopes. Included here are such old mines as the Wellington, Princeton, Pigeon, Logan,

and C.H.C. Since 1937 the company has produced 250,000 tons of lead-zinc ore of a grade similar to that at the Argentine and about 300,000 tons of high-grade pyrite. Exploration is necessary to develop lead-zinc reserves. A large tonnage of pyrite is known to exist--probably a number of million tons--some of which might be mined by a surface pit--but exploration is necessary to determine more precisely the volume. The lead-zinc ore has in the past been trucked to the Argentine mill but could now be hauled underground to the Argentine shaft by way of the St. Louis tunnel which is also the 500 level of the Argentine. The pyrite ore was hauled directly to the acid plant by way of the St. Louis tunnel.

Ore occurrence is similar to that at the Argentine--that is, at the intersection of the Blackhawk and parallel faults with limestone beds in the Middle Hermosa. At least twelve limestone beds are present and carry ore or mineralization. These limestones vary in thickness from 3 to 40 feet and occur at intervals through the Middle Hermosa formation. For the most part the orebodies are less pipelike than those at the Argentine. The dip of the beds is less and the tendency is for more tabular and larger orebodies. The reoccurrence of the favorable Middle Hermosa limestones in the Mountain Springs area is the result of the movement on some of the large east-west faults bringing them back up to near the surface.

Newman Hill

Total production from this area is not known but was large as during the peak period around the late 1880's and early 1890's the annual output was reported to be from 500,000 to 2,000,000 ounces of silver and 5,000 to 20,000 ounces of gold with considerable amounts of lead and zinc. Much of this ore was said to be very rich ranging from 30 to 200 ounces of silver and 0.2 to 2.0 ounces of gold per ton. This mineralization consisted principally of galena and sphalerite accompanied by high silver-bearing minerals such as argentite, proustite, polybasite, and tetrahedrite in a quartz gangue.

Large dumps testify to the work that has been done and numerous shafts and tunnels honeycomb an area on the side of the mountain that is 2,000 feet in width and over a mile in length. Most of these workings have been inaccessible for many years. During the 1940's the company did some prospecting at the Pro Patria mine at the north end of the area and produced about 3,000 tons of ore.

The mineralization occurs in veins and in a blanket (bedded) deposit in the Lower Hermosa formation. The productive veins generally strike

northeast and are near vertical. They are narrow, from a few inches to several feet in width. These veins have a productive vertical range of only several hundred feet and terminate upwards against a shale horizon. Beneath this shale the mineralization has spread out in a blanket deposit a few feet thick. In this area the Lower Hermosa is about 880 feet thick, however, there are several porphyry sills which add to the total thickness. The horizon favorable for the blanket mineralization appears to be about 450 feet stratigraphically below the top of the formation.

Van Winkle

Located on the north edge of the town of Rico this area was mined from the Atlantic Cable and Van Winkle shafts both of which were several hundred feet in depth but are now inaccessible. The Atlantic Cable was an old shaft and it explored and mined ore that was exposed on the bank of the Dolores River while the Van Winkle was sunk by the company in 1942. Production prior to 1942 is not known but from 1942 to 1952 the company produced 93,000 tons of lead-zinc-copper ore through the Van Winkle shaft. Mining here was shut down to concentrate on some work in the Mountain Springs area.

The mineralization consists of galena, sphalerite, and chalcopyrite associated with pyrite, hematite, and occasional magnetite. It occurs in fissures in Devonian limestone with replacement of the limestone out from the fissures. In this area the limestone is from 120 to 170 feet thick.

Silver Swan

The Silver Swan mine is a short distance south of the town on the west bank of the Dolores River. It was prospected by the company mostly from 1950 to 1953 and about 13,000 tons of lead-zinc ore were produced. The mineralization occurs principally in fissures in the Lower Hermosa formation. In general the Lower Hermosa consists of sandstone, arkose, siltstone, and shale and does not have limestones favorable for replacement like the Middle Hermosa. A hole drilled in 1927 by the St. Louis Smelting Company is reported to have encountered mineralization in the underlying Devonian limestone but this has not yet been verified.

Falcon

In the area between the Van Winkle, Argentine, and Mountain Springs there are a number of small mines such as the Falcon, Phoenix, Iron, Nora Lily, and Nellie Bly which in the aggregate have had a substantial

but unknown amount of production of lead, zinc, copper, and silver. Some of these old properties are on Nigger Baby Hill where the earliest discovery of rich silver ore was made in the oxidized and enriched zone. Most of these properties were operated 40 years or more ago and many are now inaccessible. In general the mineralization occurs in fissures and as replacements of limestone beds in the Lower and Middle Hermosa formation.

Shamrock

This area is directly west of the town on the west side of the Dolores River and includes the Shamrock and Potter mines. Most of the old work is inaccessible. The Shamrock workings are in part in Devonian limestone and in part in the Lower Hermosa formation. Old maps indicate that there was some production from the Devonian. At the Potter the mineralization is in fissures in the Lower Hermosa formation with the Devonian limestone closely underlying.

Miscellaneous Areas

Two areas which do not belong to the company but are close to its property are of interest because of work going on at the present time.

Between the Silver Swan and the Shamrock are some claims which are being worked in a small way. Details of this operation are not known but some ore is being produced. The mineralization is probably in fissures in the Lower Hermosa formation. It is said that a hole has been drilled into the underlying Devonian limestone which found 50 feet of mineralization at a depth of about 600 feet.

Further north at the old Calumet property, which is north of the Shamrock, drilling is now in progress. What are believed to be reliable sources say that the first hole at a depth of 50 feet encountered 10 feet of mineralization that assayed: 0.02 ounce gold, 12.6 ounces silver, 0.6% lead, 6.8% copper, and 2.3% zinc. This would be in the Lower Hermosa formation and near the Last Chance fault. There could be some doubt as to the results since they are dependent on drill cuttings.

Exploration Possibilities

Rico, one of the more important mining districts of Colorado, has produced about $100,000,000 of metal at present prices and it is reasonable to expect that like other mineralized areas it will produce consid-

erable more. Definite possibilities exist in a number of areas and, in addition, under certain conditions some of the tailings ponds and old dumps could have considerable value.

Exploration procedure should first involve the gathering and study of all available data and the mapping of accessible workings and certain surface areas. The actual exploration would be principally drilling in the initial stages. This drilling would be both underground and surface, although principally the latter. Holes would be to depths of from several hundred to 1,500 feet. A few areas, such as around the town of Rico and west of the river, would be amenable to geophysical surveys preliminary to drilling. Some of the more attractive exploration areas now evident are mentioned below.

At the Argentine the orebodies now being mined will continue in depth except for some fault offset and, if metal prices justify, the present shaft should be deepened. South of the area now being mined there are possibilities of other limestone beds being mineralized as well as an increase of mineralization associated with the porphyry intrusives. At the extreme south end the formations are offset by the Last Chance fault which might bring the Devonian limestone, if present, within easy reach on the south side of the fault. The possibility of mineralized structures parallel to the Blackhawk should be explored; at least two are known to exist, the Rico Con on the east and the Iron Mine on the west. The tailings pond from the Argentine mill may contain 500,000 tons averaging up to 2% combined lead and zinc. If exploration ever justified a large mill it is possible that this material could be treated at a profit.

In the Mountain Springs area the intersection of the Blackhawk and parallel fissures with limestone beds has resulted in profitable orebodies and exploration for other structures is justified as it has not been thoroughly prospected. Although at present there is an over-supply of sulphur with the resulting low price, this is probably not a permanent condition judging from the past. A reserve of several million tons of high-grade pyrite, a part of which might be mined open-cut, is a possibility and should be further explored. The calcine tailings from the acid plant operation are a potential asset. It is estimated that close to 300,000 tons have been ponded that assay 62 to 66% iron. Recently shipment of a few hundred tons a year have been made to Charles Pfizer and Co. of East St. Louis. These shipments net the company about $5 per ton. The material is reported to have some use as a soil conditioner and also as a paint pigment. Locally it has been sold to the Highway to be used as an additive to surfacing material.

Between the Argentine and Mountain Springs there is a large area where the intersections of the Blackhawk and other parallel fissures with

the limestone beds of the Middle Hermosa formation are exploration targets. Since at both extremities there are commercial orebodies it would appear certain that ore will be found in this area.

In the Newman Hill area the principal exploration target is the underlying Devonian limestone. Since it underlies a large part of the district in addition to Newman Hill, it is considered later as a single objective. An outside possibility of a large low-grade silver area exists on the fringes of the high-grade areas that were worked in the 1880's and 1890's when silver ranged in price from $.60 to $1.15 an ounce. Some work was done on this in the summer of 1969 with negative results; however, it is a large area and work was done only at one location. The old dumps on Newman Hill are of some importance if the price of silver should continue to increase as many authorities believe it might. In 1945, when silver was $.90 an ounce, the company had an investigation made by an experienced engineer. His work was not complete but indicated that on six dumps there was an aggregate tonnage of 550,000 of which 155,000 were minus one-half inch in size and assayed 0.05 ounce gold and 4.14 ounces silver. At present prices of $35 gold and $1.70 silver the gross value would be $8.79 per ton. Preliminary tests indicate that 60 to 80% of the silver and gold values could be recovered by flotation and tabling.

One of larger targets for future exploration is the Devonian limestone which underlies a large part of the district. It is only exposed in a small area at the north end of the town of Rico and here it has been mined from the Atlantic Cable and Van Winkle shafts. At these shafts it has a thickness of from 120 to 170 feet and it has been believed that it thinned and pinched out to the east and north. However, this is not certain as a quartzite in this area which was believed to be one that underlies the limestone might be an overlying one. If this is correct the Devonian limestone might underlie the Falcon, Argentine, and even the Mountain Springs areas. It is certain that it is present under Newman Hill and on the west side of the Dolores River west and southwest of Rico. Some attempt to explore it has been made. In 1939 International Smelting drilled five holes. Two were from the Lexington Tunnel which is in a highly productive part of the Hill. They encountered the limestone at depths of 800 to 1,100 feet. One hole showed slight lead and zinc at 1,075 feet and the other some copper mineralization at 1,092 to 1,102 feet. Two holes were drilled from the surface near the portal of the New Years Tunnel which is in the northwest part of the area. These penetrated the limestone at 700 to 800 feet and one showed slight amounts of lead and zinc. A fifth was drilled at the north end of town and found some lead and zinc which subsequently was mined from the Van Winkle shaft. As previously mentioned there are unverified reports that drill holes at the Silver Swan and a property to the north not held by the company have encountered mineralization in the Devonian limestone. In 1959 the

company made a magnetometer survey over a limited area southwest of the Van Winkle shaft and extending to west of the river. Several anomalies showed but have not been explored. South of Rico the formations dip to the south so that the limestone becomes increasingly deep and exploration drilling would have to be to depths of 600 to 1,200 feet or more. Study should be given to that area west of the river and approaching the monzonite stock as contact-type of deposits might occur there.

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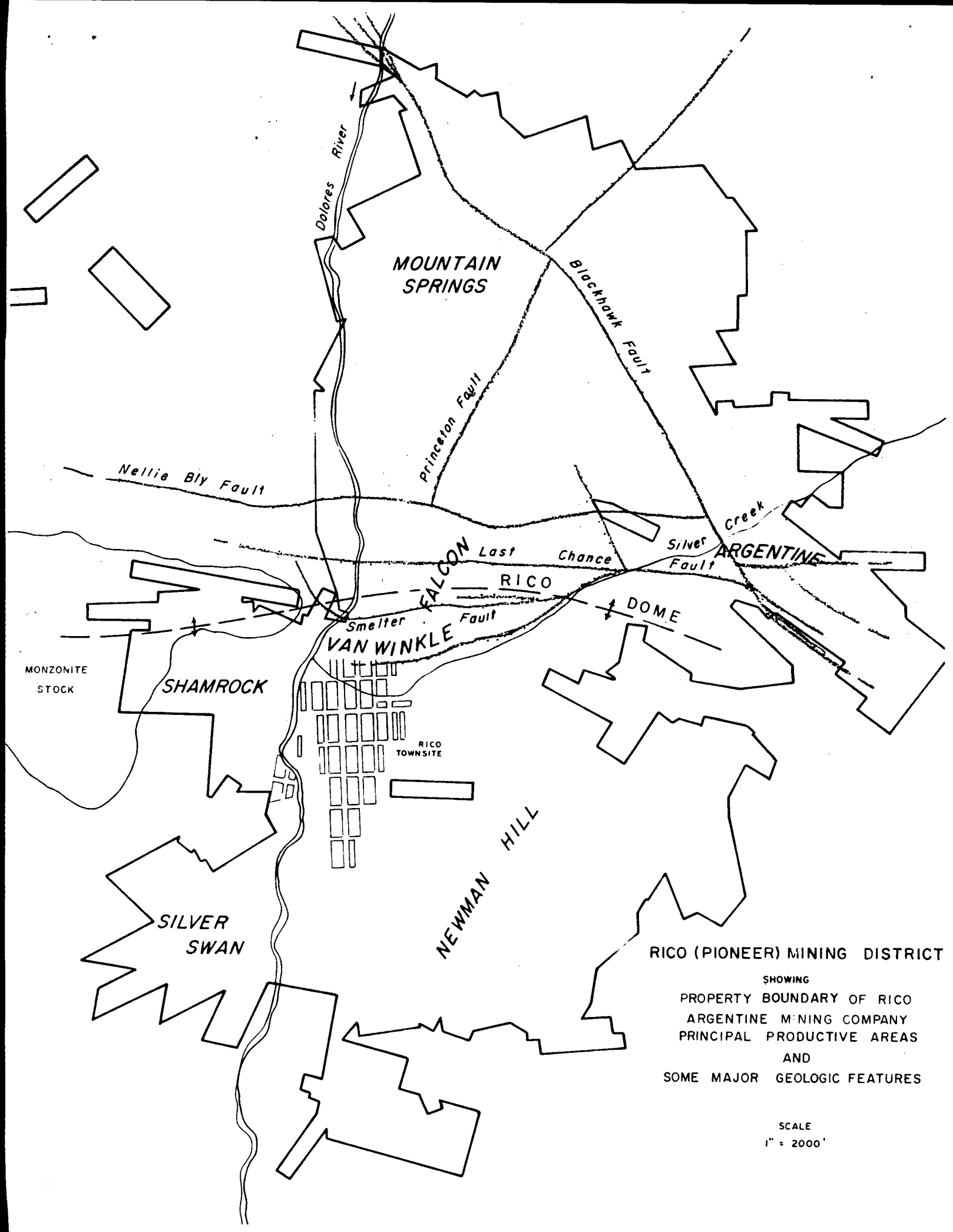

RICO (PIONEER) MINING DISTRICT

SHOWING

PROPERTY BOUNDARY OF RICO ARGENTINE MINING COMPANY

PRINCIPAL PRODUCTIVE AREAS

AND

SOME MAJOR GEOLOGIC FEATURES

SCALE

1" = 2000'